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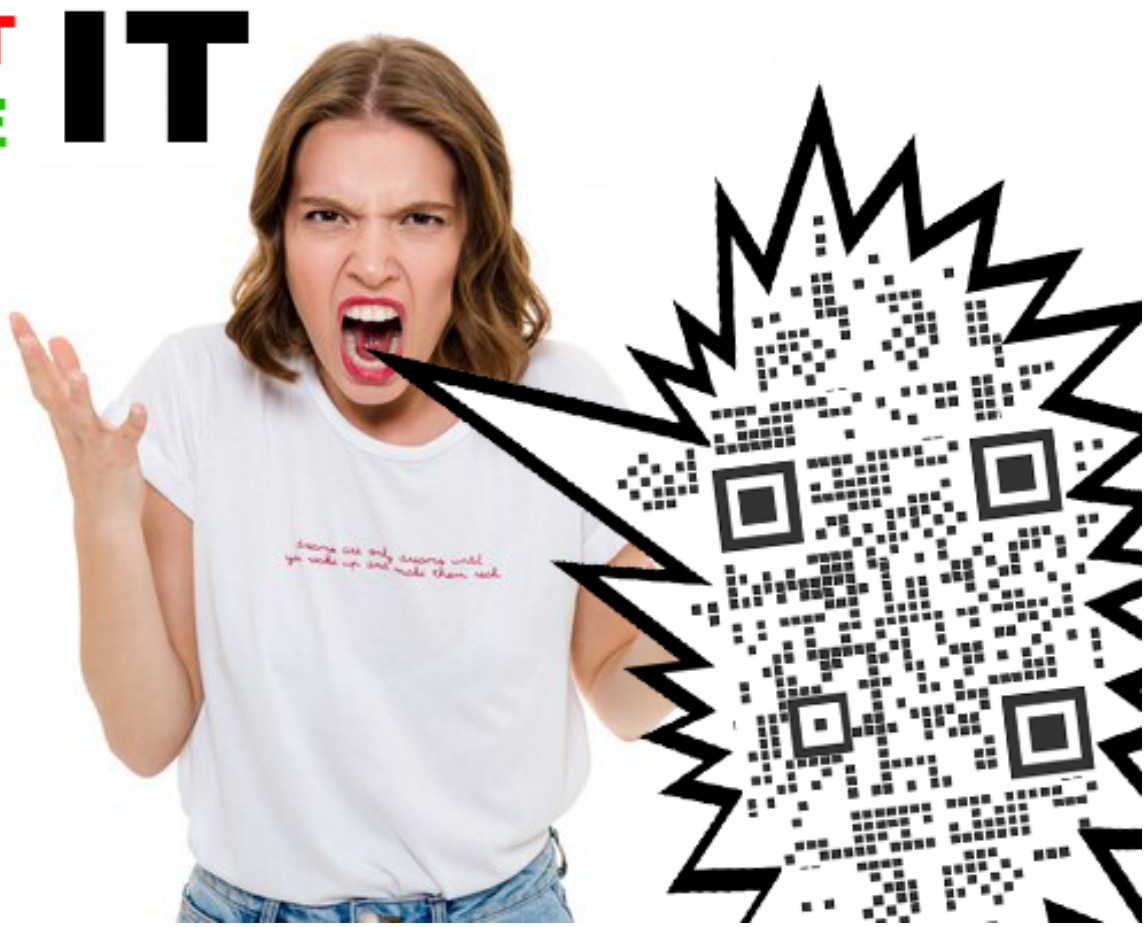


Hawaii Agricultural Experiment Station,

HONOLULU.

J. G. SMITH, Special Agent in Charge.

PRESS BULLETIN No. 10.

THE PINEAPPLE SCALE.[1]

(Diaspis bromeliae Kerner.*)*

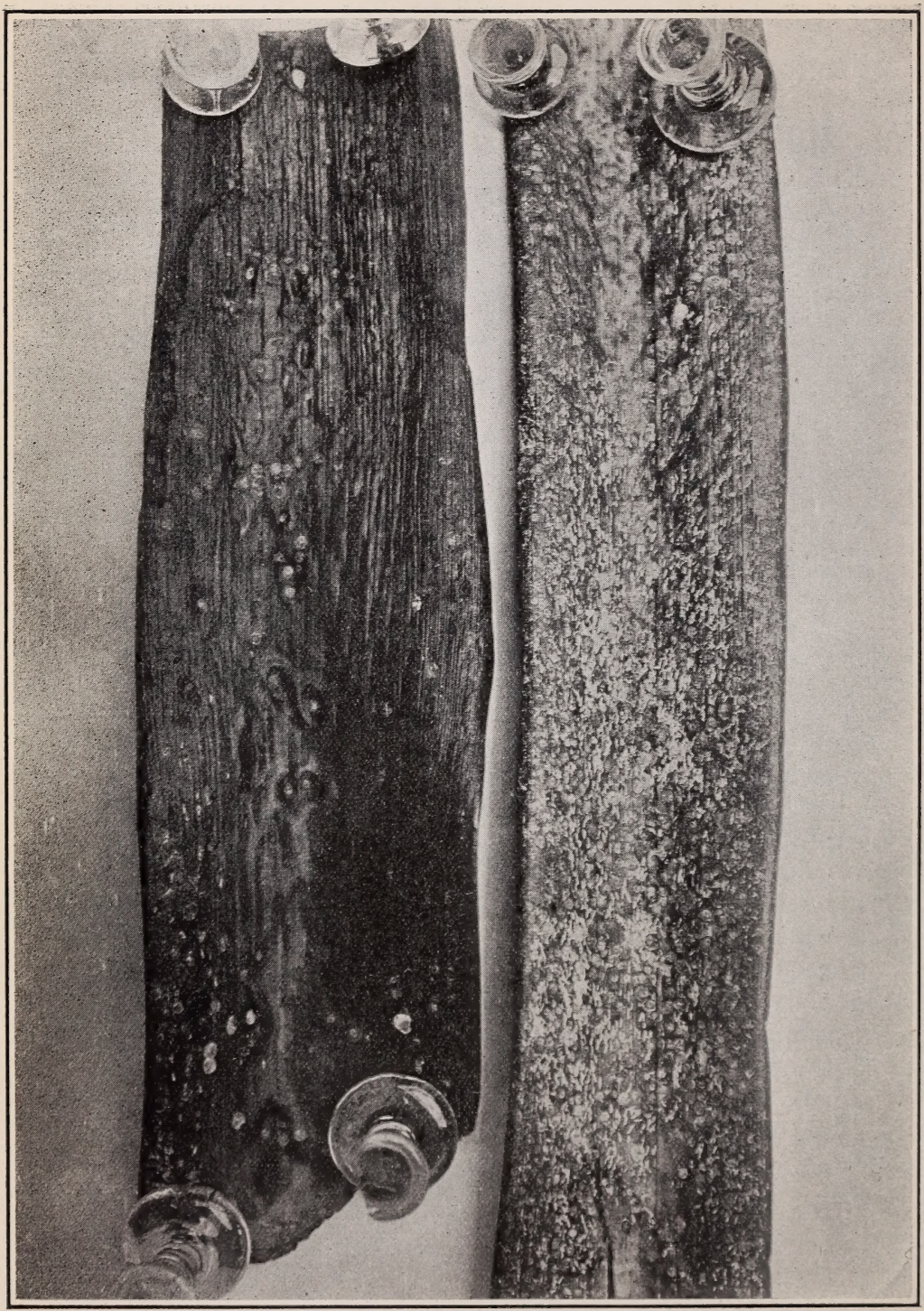
By D. L. Van Dine,

Entomologist, Hawaii Experiment Station, U. S. Dep't of Agriculture.

This pest of the pineapple is a scale-insect[2] which, because of its special fondness for this plant, has received the common name the "Pineapple Scale." The insect was first described by Kerner in 1778, and besides attacking the pineapple, is widely distributed on various plants in greenhouses. It has been reported from the countries of northern Europe; from Massachusetts, Washington, D. C., Ohio, California, and Florida in the United States; and from Mexico, Jamaica, Cape Colony, and Natal. Prof. V. L. Kellogg of Stanford University, to whom the writer is indebted for the determination of the insect, says: "Probably *bromeliae* (pineapple-scale) will

[1]Reprint from The Hawaiian Forester and Agriculturist. Vol. I. No. 5. May, 1904. pp. 111–114.

[2]For a general discussion of scale-insects see Press Bulletin No. 8 of this Station.



PL. I, THE PINEAPPLE SCALE

be found in time wherever the pineapple is grown." Other food plants are ivy, canna, hibiscus, acacia, olea (olive), billbergia, and certain varieties of greenhouse palms. The writer took the first specimens of this scale from a pineapple plantation at Wahiawa, Oahu, on October 26, 1903, and since then has observed the pest in every plantation visited on this Island and the Island of Hawaii. Although occurring generally throughout the Islands, Mrs. M. E. Fernald does not record it from Hawaii in her catalogue of Coccids,[3] nor is it found in Mr. Kirkaldy's recent work on Hemiptera in Fauna Hawaiiensis. Mr. P. H. Rolfs[4] says regarding the appearance of this insect in Florida: "It has been found repeatedly on plants imported from Hawaii, and has been disseminated to many parts of Florida." Dr. L. Reh of Hamburg, Germany, also records[5] the pest as common in these Islands, having collected specimens himself at the Government Nursery on Feb. 28, 1902.

Prof. F. V. Theobald, an English authority on economic entomology, says: "Pineapples are frequently damaged by a scale insect, which now and then causes the fruit to rot * * * This scale is the Pineapple Scale (*Diaspis bromeliae*, Kerner.) The scale is thin, circular and pure white—the females yellow or orange. Like most Diaspids, they burrow beneath the epidermis of the plants and become almost entirely hidden. It chiefly attacks the leaves, but now and then the fruit. It should be destroyed as soon as the fruit is cut."[6]

Dr. Reh in describing the work of this scale states that it attaches itself to the plant on the base of the leaf, spreading from there to the stem and eventually covering the entire plant, which it kills. On the fruit it attacks principally the green,

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[3]A Catalogue of the Coccidae of the World. Fernald, Bul. 88. Hatch Experiment Station, 1903.

[4]Pineapple Growing. Rolfs. Farmers' Bulletin No. 140. U. S. Department of Agriculture, 1901.

[5]Zeitschrift fuer Entomologie. Jan. 15, 1904, p. 30.

[6]First Report on Economic Zoology. Theobald. 1903. British Museum, London.

unripe portion. A symptom of an attack is rust colored spots on the leaves. Dr. Reh says further that milk of lime was used as an insecticide for this pest in Berlin and Russia.

These small, scale-like insects are very conspicuous, because of their color, and not easily mistaken for other forms. The scale and not the insect itself is the object commonly seen. The insect is found beneath this secretion, which serves as a shield. In the case of this insect the scale or protective armor is made up partly of a waxy secretion of the insect and partly of molted skins. The insect itself in the adult stage is quite well buried beneath the epidermis of the plant and hence the necessity of combating the pest in its early stages.

The pineapple scale can be controlled by spraying where it occurs in the field. The cheaper and easier method is by proper preventive measures to keep the pest from gaining a foothold in the plantation. These measures are to burn all leaves where the pest is at all evident after harvesting the crop, to dip young plants in an insecticide before planting and to produce the maximum vigor and health of the plants by thorough cultivation and fertilization. In the question of the control of the insect pests and diseases of plants, no one point is more important than vigorous and clean cultivation and the proper supply of plant food and moisture. It is an accepted fact in applied entomology that a healthy growing plant is capable of offering resistance to the attack of an insect pest.

Dr. L. O. Howard, entomologist of the U. S. Department of Agriculture, mentions[7] a Hymenopterous parasite, *Aspidiotiphagus citrinus* Craw., bred from the pineapple scale at Washington.

The remedies advised by Mr. Rolfs in his Bulletin on Pineapple Growing, have been verified in experiments at this Station and on our recommendation have been tried and reported as successful by the managers of two pineapple plantations.

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[7] Insect Life, Vol. VI., p. 231

Kerosene emulsion:

Whale-oil soap (or any hard soap shaved fine)	½ pound.
Water	1 gallon.
Kerosene (coal-oil)	2 gallons.

Dissolve the soap in the water while it is boiling over a fire. When the soap is well dissolved, remove the solution a safe distance from the fire and add it to the coal-oil. Churn the mixture, using a strong force pump, for a few minutes until it has a creamy consistency. If the emulsion is well made the oil will not rise to the surface on standing. This is the stock solution and will keep for several weeks. When wanted for use dilute one part of the stock solution with ten parts of water. Dip the plants in the emulsion before setting out in the field or apply as a spray to infested plants in the field. When applied as a spray in the field do not treat the plants when the fruit-bud is forming—do the spraying either before the fruit-bud starts to grow or after it is partly grown. Use only enough of the mixture to wet thoroughly the scales. If too much is used it will collect at the base of the leaves or run down about the crown and it is apt to injure the plant.

Resin wash:

Resin	pounds..5
Caustic soda (crude 78 per cent.)	" ..1
Fish oil (whale oil soap)	" ..½
Water	gallons..20

Full directions for the preparation of resin wash are given in Bulletin 3 of the Hawaii Experiment Station.

In using the resin wash follow the directions given for the kerosene emulsion.

The emulsion, being a more permanent mixture, more easily prepared and equally as efficient, recommends its use in place of the resin wash; however, the use of either mixture is a point for the planter to determine to his own satisfaction.

The question of ingredients and proper spraying apparatus is a very important one. Failure is in the majority of cases due to poor material or insufficient apparatus. A cheap pump, which soon becomes useless, is always more expensive than a well-made outfit at whatever cost. For field spraying where the ground is rocky and uneven, a compressed-air knapsack sprayer will be found suitable, while on level land, which will permit a wagon passing through the rows, a barrel outfit will be found the more desirable. These are points which only a knowledge of local conditions will permit definite advic e being given. Further information will be gladly given. Address Mr. Jared G. Smith, Director, Hawaii Experiment Station, Honolulu, Hawaii.

Honolulu, August 11, 1904.